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EXAMINER	
SUAREZ, FELIX E	
ART UNIT	**PAPER NUMBER**
2857	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/556,482	Applicant(s) AJAY ET AL.	
	Examiner FELIX E. SUAREZ	Art Unit 2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on _22 July 2010_.
2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.
3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-10,12-30,32-39,41-43 and 46_ is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5)☐ Claim(s) _____ is/are allowed.
6)☒ Claim(s) _1-10,12-30,32-39,41-43 and 46_ is/are rejected.
7)☐ Claim(s) _____ is/are objected to.
8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.
10)☒ The drawing(s) filed on _16 September 2008_ is/are: a)☒ accepted or b)☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a)☒ All b)☐ Some * c)☐ None of:
1.☒ Certified copies of the priority documents have been received.
2.☐ Certified copies of the priority documents have been received in Application No. _____.
3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Minor Informalities

1. The disclosure is objected to because of the following informalities:

In Claim 27, page 11, line 5, phrase “where t_2 is the transit time” should be –where t_1 is the transit time—according with the formula described by the Applicant on page 6 of the specification.

In Claim 29, page 12, line 1, phrase “drawing sir through” should be –drawing air through—.

In Claim 33, page 13, line 3, phrase “where t, is the transit time” should be –where t_1 is the transit time—according with the formula described by the Applicant on page 6 of the specification.

Appropriate correction is required.

Claim Rejections - 35 USC § 101

35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

2. Claims 41-43 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Computer programs claimed as computer listings per se, i.e., the descriptions or expressions of the programs, are not physical “things.” They are neither computer components nor statutory processes, as they are not “acts”

being performed. Such claimed computer programs do not define any structural and functional interrelationships between the computer program and other claimed elements of a computer, which permit the computer program's functionality to be realized. In contrast, a claimed computer- readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035 (MPEP 2106.01 [R-5]).

Claims 41-43, are rejected under 35 U.S.C. 101 because the claimed invention is directed to a computer-related non-statutory subject matter.

The claimed invention recites a computer program per se, for determining a time of flight of a signal transmitted between a transmitter and a receiver.

The Examiner also suggests that Applicant amends the claims as follows:

"**non-transitory** computer readable medium containing instructions stored therein for causing a computer processor to perform".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 29, 32 and 43 are rejected under 35 U.S.C. 102(b) as being unpatentable over Schoenfelder et al. (IDS, European Patent Application EP 1 006 500 A2 2/12/1999).

With respect to claims 29 and 43 Schoenfelder teaches a method (or a computer program product) of detecting one or more blocked sampling holes in a pipe of an aspirated smoke detector system, said method comprising:

ascertaining the base flow of fluid through a particle detector using a flow sensor of said aspirated smoke detector system (see col. 2 paragraph [0010], aspiration unit such as fan, blower, or pump, could be made small enough to fit within a smoke sensor), said aspirated smoke detector system comprising a sampling network including one or more sampling holes (see col. 8 paragraph [0058], as illustrated in FIG. 4A, the cover 30c, in part defines an inlet region 52a which circumferentially surrounds the housing 30), an aspirator for drawing air through the sampling network to the detector; and the flow sensor (see col. 7 paragraph [0048], the aspirator 36b, which could be a centrifugal blower, draws in adjacent ambient atmosphere through a portion of the filter 42a into the sensing chamber 32c);

monitoring subsequent flow through the particle detector using the flow sensor (see col. 9 paragraph [0069], FIG. 6, is a flow diagram of operation of exemplary detector 16i includes a plurality of calibration/setup steps 100, a plurality of steps 102 illustrative of normal operation, a plurality of steps 104

illustrative of processing in the presence of malfunctions, non-functions or trouble conditions and a plurality of steps 106 illustrative of air flow monitoring of the aspiration unit 36b);

comparing the subsequent flow with the base flow, and determining that one or more sampling holes of the sampling network are blocked (see col. 11 paragraph [0077], the control circuitry 34a must allow for a fail-safe response to a number of occurrences in the field, such as a clogged filter. In the process of FIG. 6, all these field occurrences are communicated by a trouble signal to the control 12 for the respective aspirated detector) and indicating a fault if the difference between the base flow and the subsequent flow exceeds a predetermined threshold (see col. 10, paragraph [0076] a flow trouble threshold is established).

With respect to claim 32, Schoenfelder further teaches that, the difference between base flow and subsequent flow is compared over a length of time (see cool. 10 paragraph [0073], subsequent to generate a trouble signal a predetermined time is permitted and verifying the operation of air flow).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-10, 13-26, 41 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walters et al. (U.S. Patent No. 5,388,445) in view of Ellul, Jr. et al. (US Patent No. 6,133,839) and Feller (U.S. Patent No. 6,178,827).

With respect to claim 1, Walters et al. (hereafter Walters) teaches a method (or a computer program product) of determining the time of flight of a signal transmitted between a transmitter and a receiver, said method comprising the steps of:

generating a first signal comprising at least one corresponding characteristic waveform feature (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline);

generating a second signal comprising at least one characteristic waveform feature (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline due to an event which causes fluctuation of pressure in such fluid; and a subset of a plurality of the pressure values is selected) and a waveform modification introduced at a predetermined point in time of the duration of the second signal (see col. 10, lines 60-62, it is necessary to verify the disturbance

which was noted has resulted in a significant change in the pipeline operating conditions; and FIG. 7, Time of Occurrence (X to A) point);

receiving said first and second signals (see col. 3, lines 44-54, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure);

Walters does not teach that; the first and the second signals are ultrasonic signals.

But Ellul, Jr. et al. (hereafter Ellul, Jr.) teaches in a smoke detector apparatus that ; with both the smoke detector 12 and the alarm(s) 14 in a power on state, smoke detector 12 will generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector 12. This ultrasonic signal is transmitted over an area, such as through an entire room or up to 100 feet, for example, from the smoke detector 12, and is received by all of the alarms 40 within the range of the smoke detector 12 and transmitter 28. As described above, when the receiver 48 of the alarm 40 receives a matching frequency ultrasonic signal, electric power is immediately supplied to the audible alarm 54 and, through relay RL2, to the strobe light 42 thereby providing an audible indication as well as a visual indication of the location of an exit by the flashing high intensity strobe light and the audible 85 db sound (see Ellul, Jr.; col. 6, lines 4-18).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a smoke detector as

taught by Ellul, Jr. , because the smoke detector of Feller allows to generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector; and allows to transmit these signals to an audible alarm , as desired.

Walters further teaches;

determining a time of reception of the introduced waveform feature modification in the second ultrasonic signal (see col. 3, lines 44-54, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure) by comparing the waveform of the first received signal to the waveform of the second ultrasonic signals and determining (see col. 2, lines 39- 46, the measurement characteristic is converted to a signal indicative of the time of arrival of the pressure wave front by comparing the slope of the current straight line to a threshold derived from a plurality of slopes obtained for previous time windows within the time interval) a point of diversion between corresponding characteristic waveform features of the first and second received signals comprising super positioning said first and second received signals (see col. 2, lines 55-64, a subset of a plurality of the pressure values is selected, and the derived pressure values are related to respective subsets, these subsets being such that a multiplicity thereof are included within the set. For each of the pressure values, upon its being derived as a current value, a rate of change of fluid pressure with time is approximated

by a slope of a current straight line derived from the plurality of pressure values in a subset specifically related to the current value);

Walter does not teach;

determining a time of flight of the introduced waveform modification based on the determined time of reception of the introduced waveform feature and its time of generation.

But Feller teaches that; the “Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors, detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid and process this information to derive a fluid flow rate. Several different sensor configurations have been used including: 1) direct measurement of the propagation time of a pulse emitted by a first transducer and received by a second transducer where the change in time is a function of fluid flow rate” (see col. 1, lines 22-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors as taught by Feller, because the Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors of Feller allows to detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid and process this information to derive a fluid flow rate; and the time of flight ultrasonic flow sensor

allows a direct measurement of the propagation time of a pulse emitted by a first transducer and received by a second transducer where the change in time is a function of fluid flow rate, as desired.

With respect to claim 14, Walters teaches a method of determining the time of flight of a signal transmitted between a transmitter and a receiver, said method comprising the steps of:

generating a first and a second signal, where both signals comprise at least one characteristic waveform feature and the second signal (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline due to an event which causes fluctuation of pressure in such fluid; and a subset of a plurality of the pressure values is selected) further comprises a waveform modification introduced at a predetermined point in time of the duration of the second signal (see col. 10, lines 60-62, it is necessary to verify the disturbance which was noted has resulted in a significant change in the pipeline operating conditions; and FIG. 7, Time of Occurrence (X to A) point);

receiving said first and second signals (see col. 3, lines 44-54, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure);

Walters does not teach that; the first and the second signals are ultrasonic signals.

But Ellul, Jr. teaches in a smoke detector apparatus that ; with both the smoke detector 12 and the alarm(s) 14 in a power on state, smoke detector 12 will generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector 12. This ultrasonic signal is transmitted over an area, such as through an entire room or up to 100 feet, for example, from the smoke detector 12, and is received by all of the alarms 40 within the range of the smoke detector 12 and transmitter 28. As described above, when the receiver 48 of the alarm 40 receives a matching frequency ultrasonic signal, electric power is immediately supplied to the audible alarm 54 and, through relay RL2, to the strobe light 42 thereby providing an audible indication as well as a visual indication of the location of an exit by the flashing high intensity strobe light and the audible 85 db sound (see Ellul, Jr.; col. 6, lines 4-18).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a smoke detector as taught by Ellul, Jr. , because the smoke detector of Feller allows to generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector; and allows to transmit these signals to an audible alarm , as desired.

Walters further teaches;

scanning through said the first received signal and the second received signal in time to determine a point of diversion between a characteristic

waveform feature of the first received signal and a corresponding characteristic waveform feature of the second received signals, wherein said point of diversion corresponds to a time of reception of the introduced waveform feature modification at the receiver (see col. 3, lines 44-54, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure).

determining a time of flight of the introduced waveform featured on the basis of the time of reception of the introduced waveform feature and its time of introduction.

But Feller teaches that; the “Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors, detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid and process this information to derive a fluid flow rate. Several different sensor configurations have been used including: 1) direct measurement of the propagation time of a pulse emitted by a first transducer and received by a second transducer where the change in time is a function of fluid flow rate” (see col. 1, lines 22-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors as taught by Feller, because the Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors of Feller allows to detect the acoustic

propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid and process this information to derive a fluid flow rate; and the time of flight ultrasonic flow sensor allows a direct measurement of the propagation time of a pulse emitted by a first transducer and received by a second transducer where the change in time is a function of fluid flow rate, as desired.

With respect to claims 2 and 15, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters teaches that, the step of determining a point of diversion further comprises:

calculating the difference between a value of the first received signal and a corresponding value of the second received signal at each point of occurrence of a characteristic waveform feature within the first received signal (see col. 3, lines 20-21, a mean and a standard deviation of all of the slopes in the slope history are derived);

designating the point of diversion as the first point of occurrence at which the calculated difference is greater than the value of the second received signal (see col. 3, lines 40-43, the first signal is rejected as being caused by an event if the second signal is indicative of an amplitude below a specific threshold selected as indicative of noise).

With respect to claims 3 and 16, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the step of:

calculating the difference between the time of the point of diversion and the time of generation of the introduced waveform feature modification (see col. 3, lines 55-64, time of arrival of a pressure wave front traveling through fluid of the pipeline due to an event which causes fluctuation of pressure in such fluid with means for measuring at the given position a characteristic related to the pressure of the fluid).

With respect to claims 4 and 17, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, comprising the steps of:

measuring a time relationship between a nominated characteristic waveform feature and the point of diversion (see col. 3, lines 55-64, time of arrival of a pressure wave front traveling through fluid of the pipeline due to an event which causes fluctuation of pressure in such fluid with means for measuring at the given position a characteristic related to the pressure of the fluid) and;

calculating the difference between the time of reception, based on the measured time relationship, and the time of generation of the nominated characteristic waveform feature (see col. 3, lines 55-64, time of arrival of a

pressure wave front traveling through fluid of the pipeline due to an event which causes fluctuation of pressure in such fluid with means for measuring at the given position a characteristic related to the pressure of the fluid, and deriving from the measured characteristic pressure values corresponding to respective discrete times occurring during an interval of time).

With respect to claim 5, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the nominated characteristic waveform feature is a feature of a first unmodified signal and the method further comprises the steps of:

generating a plurality of subsequent first unmodified signals (see col. 2, lines 27-38, a selection is made of a first duration of a time window which encompasses a plurality of the pressure values, and relating the derived pressure values to respective time windows); and

determining the time of flight of the plurality of subsequent first unmodified signals by calculating the difference between the time of reception, based on the measured time relationship, and the time of generation of the nominated characteristic waveform feature of each respective one of the plurality of subsequent first unmodified signals (see col. 2, lines 38-46, the measure characteristic is converted to a signal indicative of the time of arrival of the pressure wave front by comparing the slope of the current straight line to a threshold derive from a plurality of slopes).

With respect to claim 6, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches, comprising the step of:

repeating the steps of generating and receiving such that successive first and second ultrasonic signals are super positioned at the step of determining (see col. 2, lines 27-38, a selection is made of a first duration of a time window which encompasses a plurality of the pressure values, and relating the derived pressure values to respective time windows).

With respect to claim 7, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the characteristic waveform feature of a signal is one of:

a) a peak (see col. 9, lines 24-28, peak-to-peak noise in a pipeline; see col. 14, lines 6-10, to compute the amplitude of the wave front; and FIG. 7, Amplitude estimated; and FIG. 3);

b) a combination of peaks (see col. 9, lines 24-28, peak-to-peak noise in a pipeline; see col. 14, lines 6-10, to compute the amplitude of the wave front; and FIG. 7, Amplitude estimated);

c) a zero-crossing (see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and FIG. 7, zero-crossing point at SLOPE S_R and SLOPE S_C);

d) a combination of zero-crossings (see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and FIG. 7, zero-crossing point at SLOPE S_R and SLOPE S_C).

With respect to claim 8, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the waveform modification is introduced near the start of a signal (see FIG. 7, REF. LINE POSITION COUNTER and TIME OF OCCURRENCE X TO A).

With respect to claim 9, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the waveform modification is introduced at one of the third, fourth or fifth waveform peak after the onset of a signal (see FIG. 7 peaks under REFERENCE LINE).

With respect to claim 10, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the waveform modification comprises a phase inversion (see col. 3, lines 20-21, a mean and standard deviation of all slopes in the slop history; mean

is an absolute value for a wave e inverts negative phase wave to positive wave phase).

With respect to claims 13 and 20, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters teaches an apparatus adapted to determine the time of flight of a signal transmitted between a transmitter and a receiver, said apparatus comprising:

processor means adapted to operate in accordance with a predetermined instruction set, said apparatus, in conjunction with said instruction set, being adapted to perform the method of claim 1 (see col. 9, lines, the digital signal processor 5, accepts the data samples from the A/D converter, executes a wave front detection algorithm and generates the arrival time and amplitude outputs).

With respect to claim 18, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, Claim for a plurality of subsequent generated first unmodified signals, the time of flight is determined by:

calculating the difference between the time of reception, based on the measured time relationship, and the time of generation of the nominated characteristic waveform feature of respective subsequent first unmodified signals without reference to the point of diversion (see col. 3, lines 20-28, a mean and standard deviation of all of the slopes in the slope history are derived).

With respect to claim 19, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the nominated characteristic waveform feature of the respective subsequent signals is tracked to allow for variations in arrival time due to physical changes in the transport medium between the transmitter and receiver (see col. 3, lines determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure in such fluid with means for measuring at the given position a characteristic related to the pressure values).

With respect to claim 21, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and Walters further teaches comprising the steps of:

selecting a characteristic waveform feature of a first signal in accordance with predetermined selection criteria based on the point of diversion (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline);

generating and receiving a plurality of first signals (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline due to an event which causes

fluctuation of pressure in such fluid; and a subset of a plurality of the pressure values is selected);

Walters does not teach that; the first signal is ultrasonic signal or a plurality of first ultrasonic signals.

But Ellul, Jr. teaches in a smoke detector apparatus that ; with both the smoke detector 12 and the alarm(s) 14 in a power on state, smoke detector 12 will generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector 12. This ultrasonic signal is transmitted over an area, such as through an entire room or up to 100 feet, for example, from the smoke detector 12, and is received by all of the alarms 40 within the range of the smoke detector 12 and transmitter 28. As described above, when the receiver 48 of the alarm 40 receives a matching frequency ultrasonic signal, electric power is immediately supplied to the audible alarm 54 and, through relay RL2, to the strobe light 42 thereby providing an audible indication as well as a visual indication of the location of an exit by the flashing high intensity strobe light and the audible 85 db sound (see Ellul, Jr.; col. 6, lines 4-18).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a smoke detector as taught by Ellul, Jr. , because the smoke detector of Feller allows to generate an ultrasonic output signal immediately upon detecting smoke within an internal

chamber within the smoke detector; and allows to transmit these signals to an audible alarm, as desired.

Walters further teaches;

detecting zero-crossings of the received plurality of first ultrasonic signals which indicate the presence of the selected characteristic waveform feature in each of the received plurality of first ultrasonic signals (see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and FIG. 7, zero-crossing point at SLOPE S_R and SLOPE S_C);

estimating a position of the selected characteristic waveform feature of the received plurality of first ultrasonic signals in accordance with predetermined estimation criteria based on the detected zero crossings to provide a position estimation value (see col. 13, lines 50-65, x_R and x_M position; see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and FIG. 7, zero-crossing point at SLOPE S_R and SLOPE S_C);

processing the position estimation value to determine a corresponding estimation time (see col. 14, lines 17-30, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and P_R and P_M represent the starting point);

calculating the time of arrival of the selected characteristic waveform feature of at least one of the received plurality of first ultrasonic signals by adding

a predetermined delay time to the estimation time (see col. 14, lines 17-30, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and time of arrival x_{TOA}).

With respect to claim 22, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches that, the predetermined selection criteria comprise one of:

a) adding a predefined delay to the time of the point of diversion (see col. 14, lines 17-30, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and adding Off_R);

b) subtracting a predefined delay from the time of the point of diversion (see col. 14, lines 17-30, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and subtracting Off_M).

With respect to claim 23, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and Walters further teaches that, the predetermined estimation criteria comprise:

a) measuring the time of zero-crossings adjacent the selected characteristic waveform feature (see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the

maximum slope line; and FIG. 7, average zero-crossing point at SLOPE S_R, SLOPE S_M and SLOPE S_C) and;

b) averaging the measured time of zero-crossings (see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and FIG. 7, average zero-crossing point at SLOPE S_R, SLOPE S_M and SLOPE S_C).

With respect to claims 24, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and Walters teaches an apparatus adapted to determine the time of flight of a signal transmitted between a transmitter and a receiver, said apparatus comprising:

processor means adapted to operate in accordance with a predetermined instruction set, said apparatus, in conjunction with said instruction set (see col. 9, lines, the digital signal processor 5, accepts the data samples from the A/D converter, executes a wave front detection algorithm and generates the arrival time and amplitude outputs), being adapted to perform the method of claim 21 wherein said apparatus comprises:

signal transducing means for generating and receiving a plurality of first signals (see col. 8, lines 50-56, a transducer 1 is installed on the pipeline 2 so as to convert the internal fluid pressure to an analog electrical signal);

waveform feature selection means operatively connected to the signal transducing means and the processor means for selecting a characteristic waveform feature of a first signal in accordance with predetermined selection criteria based on the point of diversion (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline);

Walters does not teach that; the plurality of first signals are ultrasonic signals.

But Ellul, Jr. teaches in a smoke detector apparatus that ; with both the smoke detector 12 and the alarm(s) 14 in a power on state, smoke detector 12 will generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector 12. This ultrasonic signal is transmitted over an area, such as through an entire room or up to 100 feet, for example, from the smoke detector 12, and is received by all of the alarms 40 within the range of the smoke detector 12 and transmitter 28. As described above, when the receiver 48 of the alarm 40 receives a matching frequency ultrasonic signal, electric power is immediately supplied to the audible alarm 54 and, through relay RL2, to the strobe light 42 thereby providing an audible indication as well as a visual indication of the location of an exit by the flashing high intensity strobe light and the audible 85 db sound (see Ellul, Jr.; col. 6, lines 4-18).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a smoke detector as taught by Ellul, Jr. , because the smoke detector of Feller allows to generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector; and allows to transmit these signals to an audible alarm , as desired.

Walters further teaches;

zero-crossing detection means operatively connected to transducing means and the processor means for detecting zero-crossings of the received plurality of first ultrasonic signals which indicate the presence of the selected characteristic waveform feature in each of the received plurality of first ultrasonic signals (see col. 13, lines 50-65, x_R and x_M position; see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and FIG. 7, zero-crossing point at SLOPE S_R and SLOPE S_C);

signal position estimation means operatively connected to the zero-crossing detection means and the processor means for estimating a position of the selected characteristic waveform feature of the plurality of received first ultrasonic signals in accordance with predetermined estimation criteria based on the detected zero-crossings to provide a position estimation value (see col. 13, lines 50-65, x_R and x_M position; see col. 14, lines 17-20, the arrival time is considered to be the x-coordinate of

the intersection of the reference line and the maximum slope line; and FIG. 7, zero-crossing point at SLOPE S_R and SLOPE S_C);

wherein the processor means processes the position estimation value to determine a corresponding estimation time and calculates the time of arrival of the selected characteristic waveform feature of at least one of the plurality of received first ultrasonic signals by adding a predetermined delay time to the estimation time (see col. 14, lines 17-30, the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and P_R and P_M represent the starting point and time of arrival x_{TOA}).

With respect to claim 25, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches said signal position estimation means comprises a dual slope integrator (see col. 15, lines 52-55, best-fit maximum slope line circuit; and FIG. 5 ITEM 36).

With respect to claim 26, Walters in combination with Ellul, Jr. and Feller teaches all the features of the claimed invention; and further Walters further teaches said plurality of received first signals are digitized and said processor means comprises digital data processing means comprising said zero-crossing

detection means and said signal position estimation means (see col. 9, lines 48-52, DSP and A/D converter).

With respect to claim 46, Walters teaches a method of determining the time of flight of a signal transmitted between a transmitter and a receiver, said method comprising the steps of:

generating a first signal comprising at least one characteristic waveform feature (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline);

generating a second signal comprising at least one Characteristic waveform feature (see col. 2, lines 18-27, determining at a given position on a pipeline a time of arrival of a pressure wave front traveling through fluid in the pipeline due to an event which causes fluctuation of pressure in such fluid; and a subset of a plurality of the pressure values is selected) and a waveform modification introduced at a predetermined point in time of the duration of the second signal (see col. 10, lines 60-62, it is necessary to verify the disturbance which was noted has resulted in a significant change in the pipeline operating conditions; and FIG. 7, Time of Occurrence (X to A) point);

receiving said first and second generated signals (see col. 3, lines 44-54, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure);

Walters does not teach that; the first and the second signals are ultrasonic signals.

But Ellul, Jr. teaches in a smoke detector apparatus that ; with both the smoke detector 12 and the alarm(s) 14 in a power on state, smoke detector 12 will generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector 12. This ultrasonic signal is transmitted over an area, such as through an entire room or up to 100 feet, for example, from the smoke detector 12, and is received by all of the alarms 40 within the range of the smoke detector 12 and transmitter 28. As described above, when the receiver 48 of the alarm 40 receives a matching frequency ultrasonic signal, electric power is immediately supplied to the audible alarm 54 and, through relay RL2, to the strobe light 42 thereby providing an audible indication as well as a visual indication of the location of an exit by the flashing high intensity strobe light and the audible 85 db sound (see Ellul, Jr.; col. 6, lines 4-18).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include a smoke detector as taught by Ellul, Jr. , because the smoke detector of Feller allows to generate an ultrasonic output signal immediately upon detecting smoke within an internal chamber within the smoke detector; and allows to transmit these signals to an audible alarm , as desired.

Walters further teaches;

determining, a point of diversion between corresponding characteristic waveform features of the first and second received signals comprising super positioning said first and second received signals such that said point of diversion corresponds to an arrival time of the introduced waveform feature modification at the receiver (see col. 3, lines 44-54, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure), wherein the step of determining a point of diversion further comprises:

calculating the difference between a value of the first received signal at a time and a value of the second received signal at a corresponding time for each point of occurrence of the characteristic waveform feature within the first received signal (see col. 3, lines 20-21, a mean and a standard deviation of all of the slopes in the slope history are derived);

designating the point of diversion as the first point of occurrence at which the calculated difference is greater than the value of the second received signal (see col. 3, lines 40-43, the first signal is rejected as being caused by an event if the second signal is indicative of an amplitude below a specific threshold selected as indicative of noise) and wherein the method further comprises measuring a time relationship between a nominated characteristic waveform feature and the point of diversion (see col. 3, lines 55-64, time of arrival of a pressure wave front traveling

through fluid of the pipeline due to an event which causes fluctuation of pressure in such fluid with means for measuring at the given position a characteristic related to the pressure of the fluid) and;

calculating the difference between the time of reception, based on the measured time relationship, and the time of generation of the nominated characteristic waveform feature (see col. 3, lines 55-64, time of arrival of a pressure wave front traveling through fluid of the pipeline due to an event which causes fluctuation of pressure in such fluid with means for measuring at the given position a characteristic related to the pressure of the fluid, and deriving from the measured characteristic pressure values corresponding to respective discrete times occurring during an interval of time) and wherein the nominated characteristic waveform feature is a feature of a first unmodified signal and the method further comprises the steps of:

generating a plurality of subsequent first unmodified signals (see col. 2, lines 27-38, a selection is made of a first duration of a time window which encompasses a plurality of the pressure values, and relating the derived pressure values to respective time windows) and;

determining the time of flight of the plurality of subsequent first unmodified signals by calculating the difference between the time of reception, based on the measured time relationship, and the

time of generation of the nominated characteristic waveform feature of each respective one of the plurality of subsequent first unmodified signals (see col. 2, lines 38-46, the measure characteristic is converted to a signal indicative of the time of arrival of the pressure wave front by comparing the slope of the current straight line to a threshold derive from a plurality of slopes).

5. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Schoenfelder et al. (IDS, European Patent Application EP 1 006 500 A2 2/12/1999) in view of Feller (U.S. Patent No. 6,178,827).

With respect to claim 30, Schoenfelder teaches all the features of the claimed invention, except that, Schoenfelder does not teach that, the flow sensor is an ultrasonic flow sensor

But Feller teaches that; the “Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors, detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid and process this information to derive a fluid flow rate. Several different sensor configurations have been used including: 1) direct measurement of the propagation time of a pulse emitted by a first transducer and received by a second transducer where the change in time is a function of fluid flow rate” (see col. 1, lines 22-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Schoenfelder to include a Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors as taught by Feller, because the Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors of Feller allows to detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid, as desired.

With respect to claim 34, Schoenfelder teaches an aspirated smoke detector comprising:

a particle detector (see col. 1 paragraph [0007], an aspirated detector includes at least one ambient condition sensor, such as a smoke or a gas sensor),

a sampling network including one or more sampling points (see col. 8 paragraph [0058], as illustrated in FIG. 4A, the cover 30c, in part defines an inlet region 52a which circumferentially surrounds the housing 30); and

an aspirator for drawing air through the sampling network to the detector (see col. 7 paragraph [0048], the aspirator 36b, which could be a centrifugal blower, draws in adjacent ambient atmosphere through a portion of the filter 42a into the sensing chamber 32c),

an inlet (see col. 8 paragraph [0060], the circumferential slot 52a can be divided into inflow and outflow regions),

an outlet (see col. 8 paragraph [0060], the circumferential slot 52a can be divided into inflow and outflow regions)

Schoenfelder does not teach;

an ultrasonic flow in fluid arranged to detect the flow rate of air entering the particle detector.

But Feller teaches that; the “Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors, detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid and process this information to derive a fluid flow rate. Several different sensor configurations have been used including: 1) direct measurement of the propagation time of a pulse emitted by a first transducer and received by a second transducer where the change in time is a function of fluid flow rate” (see col. 1, lines 22-43).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Schoenfelder to include a Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors as taught by Feller, because the Transit-time ultrasonic flow sensors, also known as "time-of-flight" ultrasonic flow sensors of Feller allows to detect the acoustic propagation time difference between the upstream and downstream ultrasonic transmissions resulting from the movement of the flowing fluid, as desired.

With respect to claim 35, Schoenfelder in combination with Feller teaches all the features of the claimed invention; and Schoenfelder further teaches that, the flow sensor is in fluid communication with the sampling network and is operationally arranged to measure the partial flow of fluid through a sampling network (see col. 3 paragraph [0016], filter for inflowing ambient air and filter for out-flowing ambient air from the sensing chamber).

With respect to claim 36, Schoenfelder in combination with Feller teaches all the features of the claimed invention; and Schoenfelder further teaches that, the particle detector detects particles in a portion of the air flow flowing through the sampling network (see col. 3 paragraph [0016], filter for inflowing ambient air and filter for out-flowing ambient air from the sensing chamber).

With respect to claim 37, Schoenfelder in combination with Feller teaches all the features of the claimed invention; and Schoenfelder further teaches that, the flow sensor is located in the sampling network (see col. 3 paragraph [0016], filter for inflowing ambient air and filter for out-flowing ambient air from the sensing chamber).

With respect to claim 38, Schoenfelder in combination with Feller teaches all the features of the claimed invention; and Schoenfelder further teaches that,

the flow sensor is located in a housing for the particle detector (see col.9 paragraph [0065], cylindrical housing).

With respect to claim 39, Schoenfelder in combination with Feller teaches all the features of the claimed invention; and Schoenfelder further teaches, having a branch in the inlet allowing air to bypass the particle detector (see col. 9 paragraph [0066], inflowing air, entering via the annular channel, passes through the filter).

6. Claim 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walters et al. (U.S. Patent No. 5,388,445) in view of Ellul, Jr. et al. (US Patent No. 6,133,839), Feller (U.S. Patent No. 6,178,827)and Hill et al. (U.S. Patent No. 5,131,052).

With respect to claim 12, Walters et al. (hereafter Walters) in combination with Ellul, Jr. et al. (hereafter Ellul, Jr.) and Feller teaches all the features of the claimed invention, except that the combination Walters with Ellul, Jr. and Feller does not teach; wherein the ultrasonic signals are provided by transducers driven at resonant frequencies in a frequency range of about 60 kHz to about 90 kHz.

But Hill et al. (hereafter Hill) teaches in a mid-range loudspeakers assembly propagating waves in phase, that the loudspeaker generally referred

as mid-range speaker operate over a frequency range of approximately 150 kHz to 6 kHz.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Walters to include mid-range loudspeakers assembly propagating waves as taught by Hill, because the mid-range loudspeakers assembly propagating waves of Hills allows to operate over a frequency range of approximately 150 kHz to 6 kHz, as desired.

7. Claims 27, 28, 33 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schoenfelder et al. (European Patent Application EP 1 006 500 A2 2/12/1999) in view of Walters et al. (U.S. Patent No. 5,388,445).

With respect to claims 27, 33 and 42 Schoenfelder et al. (hereafter Schoenfelder) teaches a method (a processor or a computer program product) of monitoring flow through a particle detector of an aspirated smoke detector system, the method comprising the steps of:

ascertaining the base flow of fluid through a particle detector using a flow sensor (see col. Paragraph [0010], aspiration unit such as fan, blower, or pump, could be made small enough to fit within a smoke sensor);

monitoring subsequent flow through the particle detector (see col. 2 paragraph [0012], detector with a communication link to a remote system control unit);

comparing the subsequent flow with the base flow, and indicating a fault if the difference between the base flow and the subsequent flow exceeds a predetermined threshold wherein base flow and subsequent flow are determined at respective times (see col. 10, paragraph [0076] a flow trouble threshold is established) according to the following general flow calculation:

f=SxA

where f = volumetric flow (see col. 9 paragraph [0064], the detector includes a volume air flow);

A = cross sectional area of an air flow path through the detector system (see col. 9 paragraph [0064], the detector includes a cylindrical housing) ;

Schoenfelder does not teach;

where

s = speed of air through the detector system such that s is given by;

$$s = \frac{d}{2}\left(\frac{1}{t_2} - \frac{1}{t_1}\right)$$

where

t_1 is the transit time of a signal transmitted in a forward direction, being generally in the direction of flow, from a first transducer located adjacent the flow path to a second transducer located generally opposite the first transducer and adjacent the flow path;

t_2 is the transit time of a signal transmitted in a reverse direction, being generally against the direction of flow, from the second transducer to the first transducer;

d is a distance traveled by the signal between the first and second transducer;

and wherein both t_1 and t_2 are determined in accordance with the method claim 1.

But Walters et al (hereafter Walters) teaches, that the arrival time is considered to be the x-coordinate of the intersection of the reference line and the maximum slope line; and P_R and P_M represent the starting point and time of arrival x_{TOA} (see walters; col. 14, lines 17-30).

Walters also teaches that receiver, determining an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline due to an event which causes fluctuation of pressure (see Walters; col. 3, lines 44-54).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Schoenfelder to include an arrival time and amplitude of pressure wave front traveling through fluid in a pipeline as taught by Walters, because the arrival time and amplitude of pressure wave front traveling through fluid in a pipeline of Walters allows to calculate the speed given by universal equation velocity is equal to distance divided by the time, as desired.

With respect to claim 28 Schoenfelder in combination with Walters teaches all the features of the claimed invention; and Schoenfelder further teaches an apparatus adapted to monitor flow through a particle detector of an aspirated smoke detector system, said apparatus comprising:

processor means adapted to operate in accordance with a predetermined instruction set, said apparatus, in conjunction with said instruction set, being adapted to perform the method of claim 27 (see col.1 paragraph [0007], a the control circuit is a part of a programmed processor).

Response to Arguments

8. Applicant's arguments with respect to the claims have been fully considered but they are moot in view of the new ground(s) of rejection set forth hereinbefore.

Conclusion

Prior Art

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Wiemeyer et al. [U.S. Patent No. 5,926,098] describes an aspirated detector.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Felix Suarez, whose telephone number is (571) 272-2223. The examiner can normally be reached on weekdays from 8:30 a.m. to 5:00 p.m.
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eliseo Ramos-Feliciano can be reached on (571) 272-7925. The fax phone number for the organization where this application or proceeding is

assigned is 571-273-8300 for regular communications and for After Final communications.
September 29, 2010

/Felix E Suarez/
Examiner, Art Unit 2857

/Mohamed Charioui/
Primary Examiner, Art Unit 2857